

Accelerator Systems Division Highlights for the Week Ending June 15, 2001

ASD/LBNL: Front End Systems

IS/LEBT #1 have been reassembled at the Integrated Testing Facility, and a 13.56-MHz ignition system has been added to the instrumentation. A total of ten RF antennae (9 of them coated using the plasma spray technique, and 1 made from tantalum) for the ion source has been received by LBNL from the ORNL-SNS ion-source group.

RFQ Module #4 has undergone the final bead-pull measurements and was found to be right on the desired resonant frequency. It can now be sent to the braze vendor.

A series of discussions with ORNL-SNS, LANL, and BNL staff was held with the aim of assessing the merits of an external Diagnostic Beamline for the Front End. R. Keller will compose a technical description including cost and schedule in preparation for a CPR, and Sasha Aleksandrov will coordinate the composition of a Physics note.

The FES team finalized contributions for the upcoming Particle Accelerator Conference in Chicago; 5 abstracts have been submitted with FES staff as principal authors.

ASD/LANL: Warm Linac

The CCL hot model continues to receive daily attention. It was determined that the clogged cooling channels in the endwalls were due to the vendor not following manufacturing specifications and procedures. The solution to this problem was to e-beam weld flanges over new cooling channels machined into the end walls last week. The weld caused an unacceptable $\sim 0.005''$ cavity warp. The end walls were heat-treated this week. Endwall equator surfaces and cavity noses are being re-machined today to produce flat surfaces for brazing. Over the weekend, parts will be cleaned and transported to LANL where they will be stacked and undergo preliminary RF measurements. We hope to perform final frequency checks on Monday with the goal of repackaging and shipping components to the vacuum furnace braze house late that afternoon. (WBS 1.1.2.2)

The high-voltage converter modulator (HVCM) was successfully operated for many hours at high average power.

The 402.5-MHz BMEWS klystron was operated near its limit, corresponding to a 230-kW average HVCM power, 4-MW pulsed power, 93 kV output at 40 Hz with 1.4 ms pulse width. We should be able to get an additional 100 kW next week when we extract RF from the tube for SNS circulator acceptance tests. The HVCM worked well during these tests. The protection circuitry performed as designed, rapidly shutting down the HVCM during a klystron arc and automatically restarting shortly after the arc clear. Towards the conclusion of these tests, we experienced an IGBT shoot-through fault. We believe we have an understanding of the issues and methods to prevent future problems. Investigation reveals that the failure could have been caused by excessive metal filings between the HV terminals of the IGBT, or a possible elevation of junction temperature due to thermally isolated busbar located between the IGBT and main header. (WBS 1.4.1.2)

We are pleased to welcome David Anderson from ASD. David arrived this week for a two-month stay, working with the HVCM team. (WBS 1.4.1.2)

The contract for fabricating the DTL tanks was awarded this week. The manufacturing process plan is due the week of July 9. (WBS 1.4.2.2)

We received bids for of the CCL structure. This is best value procurement. Bids included proposals for a fully tuned system as well as for components. (WBS 1.4.4.2)

Studies are in progress to reduce the effective phase jitter with active phase control. Phase spread could be compensated for if the phase of the energy corrector is adjusted by the phase of the beam at the end of the linac, as detected by a phase loop at this location. We assume a dynamic control of 0.5% on the RF amplitude and of 1° on the phase of all the klystrons. Fig. 1 shows the jitter in the output phase and energy produced by 10,000 simulation

runs. Fig. 2 shows the effective jitter of the output beams. These beams then travel a distance D to an energy corrector that removes the energy spread. Further studies are underway to find the optimum location for the placement of the energy corrector cavity. (WBS 1.4.5.3)

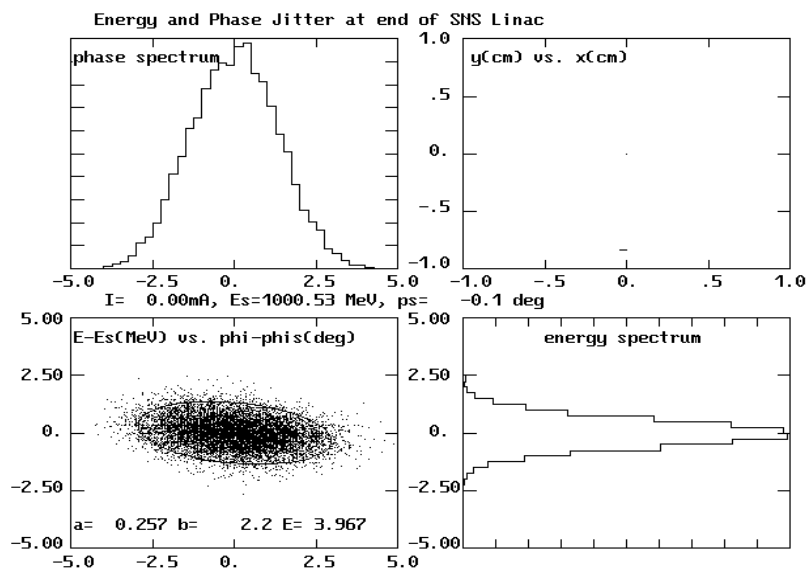


Fig. 1: Jitter in the output phase and energy predicted by 10,000 simulation runs.

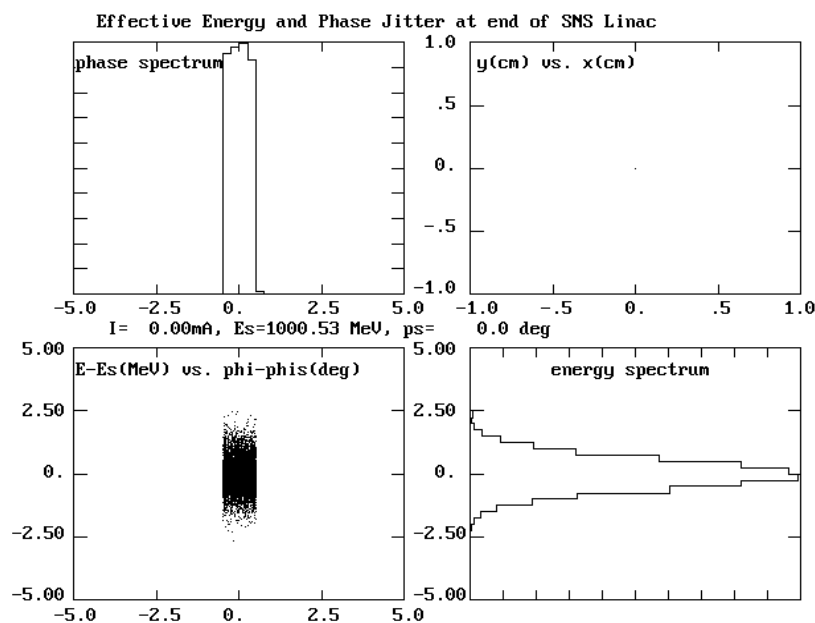


Fig. 2: Effective jitter of the output beam center.

Dan Stout and Gary Johnson visited LANL for two days this week to discuss hand off and conventional facility interface issues such as FIDP loads and the final FELK design package. (WBS 1.4.6)

Two PCRs were submitted dealing with scope changes in conventional facilities (PCR LI 01 044) and linac diagnostics (LI 01 076). (WBS 1.4.6)

ASD/JLAB: Cold Linac

Fabrication on the Warm Compressor Skids, Cold Compressors, and 4.5K Coldbox continues. The 4th Cold Compressors design review is scheduled for 26-Jun. The contract for 4.5 K Coldbox spares was placed.

The bayonet / valves for the TL "Tees" was shipped to ORNL. The second shipment in two weeks will contain all the return shield bayonets and the supply 4.5K bayonets; the former are complete.

The MB cavity #1 He vessel assemble is complete and vibration dampening measurements are in progress.

The calculations continue for stiffening the MB He vessels. It appears that we will add both internal and external stiffening cones to meet the requirement of $<3.0 \text{ Hz}/(\text{MV/m})^2$.

The MB cavities #2-4 are in final welding; the end groups are complete and the cavity / He vessel stiffening is being added.

The second pair of Fundamental Power Coupler is onsite. The 2nd phase RFP bids are due in two weeks. The APP for the 3rd phase has been written.

The EP parts bid is being awarded. Work on the specification for the EP cabinet is complete.

The Cavity vendor 2nd phase bids are being evaluated.

The PCR for picking up the optional Nb for three additional CM's has been submitted.

ASD/BNL: Ring

BNL engineers are at IE Power this week to conduct acceptance tests on the first article injection bump power supply.

A videoconference was conducted to review Bill Weng's proposal for early handoff of technical components between BNL and SNS/OR.

ETC ground rules established between BNL and ASD.

SNS staff are preparing for the upcoming PAC conference. Thirty-three talks are scheduled.

Verified that our FY01 procurement schedule will meet or exceed our BA availability.

A videoconference design review was conducted between BNL and SNS/OR on injection magnets and components.

ME Group conducted a final review of the 30Q44 quadrupole drawing package in preparation for RFQ release.

Existing BNL purchase orders are being sorted to ID direct shipments to SNS/OR in support of Remote Receiving at the RATS Building.

Vendor (Tesla) reported that first HEBT dipole coils have been wound.

Vendor (SDMS) reported that first HEBT dipole vacuum chamber should arrive at BNL next week.

First two Ring arc dipole cores are in route to BNL from California.

At vendors request, RFQ for 21cm sextupole/octupole corrector magnet package has been extended one week.

Controls:

The control system for the Central Helium Liquefier will now include 4 PLC systems. The additional PLC will handle devices that are not completely defined/installed when the warm compressor testing starts. The warm compressors will not be stopped once they are started and changes to the PLC that controls them will be difficult. The new PLC will provide an easy means for incorporating changes in the control system with minimal impact on the continued operation of the CHL facility.

A meeting was held concerning the architecture and software layers between the physics applications, diagnostics, and controls. We decided on the architecture for the diagnostics and formed a team to work on the high level apps - two guys working on early commissioning tools in Matlab and two working on the Orbit difference tool - including the application architecture. A weekly videoconference will start in two weeks to discuss interface issues for the applications required for commissioning.

ASD/ORNL: Integration

Installation Support

Accelerator Physics

John Galambos and Paul Chu participated in an Applications programming workshop, which also included participants from controls and diagnostics. Among the issues agreed upon are a method for obtaining time correlated data via channel access, an architecture to start with for the application programming environment, and a first application to be delivered in six months.

Eugene Tanke participated in the USPAS School in Boulder Colorado.

Global coordinates of all the linac magnets were provided to the survey and alignment group.

Operations

Ion Source Group

Ten ion source RF antennas, the nine coated by Thermal Spray Technology, and one bare Tantalum antenna were shipped to LBNL to be tested in one of the ion sources.

Efforts are in progress to vary the geometry of the ion source antenna without a substantial change of its impedance. It is hoped that larger distances between the different sections reduce the frequency and destructive power of secondary discharges that appear to destroy the antenna prematurely.

Martin Stockli returned from his trip visiting the Universities of Frankfurt and Freiburg, and PSI. Ion source pictures can be seen on \\Snsnta\users\Stockli\pictures. A trip report is in progress.

We are pleased that Sonali Shukla joined us. She will be working on several ion source projects until fall, when she returns to UT to continue her physics studies.

The analysis of the thermal loads and temperature excursions of the antenna has been refined. The results, however, remain unchanged: As long as the antenna is water-cooled, the average thermal load produces only a small temperature rise, mostly dominated by the thermal conductivity of the porcelain coating. As expected, the failures must be caused by processes that dump a significant fraction of the power in to a very limited area of the antenna.

On Thursday and Friday Martin Stockli visited the Institute of Applied Physics of the Frankfurt University and talked to Profs. Ratzinger, Klein, Becker, and Schempp, and Drs. Volk and Kleinod. Discussions focused on our ion source as well as the Frankfurt H- source, ESS, and the new West European initiative to coordinate the development of reliable, high-current H- sources. A proposal requesting European funds will be submitted in the near future. In

addition, many unpublished details about the Frankfurt H- source were learned. Additional discussions focused on the modeling of the formation of negative ion beams, an unsolved challenge, which we plan to address during the next ion source conference.

RF Group

David Anderson is at LANL till August 1st. He is developing specification for HVPS for JLab 1 MW test stand. Working with LANL, editing build-to-print specification for HVCN.

We participated in meetings to plan the EPICS training and implementation for Conventional Facilities (Sverdrup).

We created a set of Edm symbols to impose consistency in control screens for equipment such as valves and transformers.

In a process of collecting the LLRF tech information and work progress at the partner labs Current study is focusing on MEBT LLRF proposed by LBL. Will pay a visit to LBL in early July. The technical aspect of MEBT LLRF seems OK. The planned visit will be focusing on the issues in the commissioning at present, and Maintainability down the road, mainly the maintenance of the firmware on the digital board.

Cryo Transfer Line Group

We completed the assembly of the first 40' return section of the transfer line that connects the CHL to the tunnel "T" connection.

We attended a meeting at Jefferson Lab concerning the installation schedule of the CHL and the tunnel supply and return transfer lines.

We are assembling a complete installation schedule for the CHL components and the transfer lines.

We attended the cryogenic safety committee meeting.

Mechanical Group

Magnet Measurement Group

Power Supply Group

The power supply group has finalized the structural requirement for ring duct banks and embedded conduits for ring power supplies that were necessary after the ring tunnel alcove elimination.

Coordination and documentation effort has started this week, utilizing two members of the power supply group, to generate installation block diagrams for magnet power supplies based on LANL and BNL input.

Survey and Alignment Group

Beam Diagnostics Group